

**INDUSTRIAL TECHNOLOGY INNOVATION ADVISORY COMMITTEE (ITIAC)
MEETING MINUTES**

Date and Time: July 17, 2024, 12 p.m. – 5 p.m. EDT
Location: Virtual (Zoom), hosted by DOE Industrial Energy and Decarbonization Office (IEDO)
Purpose: Industrial Technology Innovation Advisory Committee (ITIAC) Meeting

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Participants

Committee Members: (*in attendance*) Ms. Sharon Nolen, Chairperson; Dr. Sunday Abraham; Dr. Cathy Choi; Dr. Sue Clark; Dr. Subodh Das; Ms. Betsy Dutrow; Dr. Neal Elliott; Ms. Anna Fendley; Dr. Comas Haynes; Dr. Eric Masanet; Dr. Joe Powell; Dr. Abigail Regitsky; Mr. Jeffrey Rissman; Dr. Sridhar Seetharaman; Ms. Jolene Sheil; Ms. Sasha Stashwick

Department of Energy (DOE) Participants: ITIAC Designated Federal Officer (DFO) Dr. Zachary Pritchard; Alternate Designated Federal Officer (ADFO) Dr. Celina Harris; Mr. Joe Cresko; Dr. Paul Gauche; Dr. Avi Shultz

ITIAC Staff: Rachel Davenport; Pamela de los Reyes; Caroline Dollinger; Simone Hill-Lee

Committee Members Not Attending: Mr. Sergio Espinosa; Dr. Arun Majumdar; Dr. Akshay Sahni

Meeting Summary

The second meeting of the Industrial Technology Innovation Advisory Committee (ITIAC) was held July 17, 2024, virtually by Zoom. ITIAC subcommittees presented their work to date outlining priorities, scope, and organization of their respective sections of the ITIAC report to be presented to the Secretary of Energy with analysis and recommendations for decarbonization of the industrial sector as outlined in the ITIAC Charter. The Committee closed out the meeting with a discussion of topics for the next full Committee meeting.

In accordance with the provisions of Public Law 92-463, the meeting was open to the public. Members of the public were invited to attend virtually via the Zoom platform. As described in the Federal Register Notice (89 FR 53069), members of the public were able register to provide oral statements and submit written statements to ITIAC@ee.doe.gov.

Materials Provided to the Committee

- [Agenda](#)
- Mural brainstorming document
- Meeting presentation slides
- DOE Current Work and Gaps Assessment Subcommittee outline
- DOE Industrial Programs Overview

Materials provided to the Committee are available on the [ITIAC website](#).

Welcome and Opening Remarks

ITIAC Designated Federal Officer (DFO) Dr. Zach Pritchard opened the ITIAC meeting at 12:02 p.m. EDT.

ITIAC Chairperson Ms. Sharon Nolen welcomed everyone to the meeting and introduced the Committee's two new members, Dr. Sunday Abraham, director of research and development for SSAB Americas, and Mr. Sergio Espinosa, international representative and policy advisor at the International Brotherhood of Electrical Workers Department of Government Affairs.

Chairperson Nolen reviewed the agenda for the day's activities, including subcommittee report outs and planning for the next meeting. She introduced the Mural Board in which members may make comments and suggestions for the ITIAC report to the Secretary of Energy throughout the meeting.

IEDO Director Dr. Avi Schulz thanked ITIAC members for their contributions to ITIAC and its subcommittees. He stated their work is valuable to DOE and is helping in charting the future of the DOE strategy in decarbonization.

Report Out: ITIAC Subcommittee on Barriers

Subcommittee lead Dr. Cathy Choi introduced the members and goals of the ITIAC Subcommittee on Barriers and presented slides outlining the Subcommittee's scope, milestones for the ITIAC report, and progress to date. She stated that success for the Subcommittee included identification of barriers to decarbonization of all sectors of industry and definition of successful solutions. She talked the members through the barriers that were identified by the Subcommittee and highlighted some pathways toward overcoming the barriers.

Discussion Highlights

Mr. Jeffrey Rissman agreed that computer modeling might be an option to address Barrier 3 (pilot to demonstration to deployment) to reduce costs and asked if there are limits to the modeling accuracy.

- **Dr. Choi** responded that modeling may not be a 100% replacement for the experimental and validation processes, but every incremental improvement helps keep costs down. Challenges with transformational technology are that there is no history to build on and the first step is to understand the new technology.
- **Dr. Neal Elliott** noted that if modeling is constrained to technology that is already validated and functioning but needs to scale up from the pilot to the full implementation, then use of a virtual twin to run scenarios may minimize cost and physical manipulation of the initial scale up.
- **Dr. Joseph Powell** commented that not all processes need to be demonstrated and some technology can go directly to large scale if the technology components (catalysts, chemistry) are well understood.
- **Chairperson Nolen** agreed that modeling may help with building comfort and acceptance of technologies in industry.

Chairperson Nolen asked for further explanation of the second barrier listed, electricity cost.

- **Dr. Choi** responded that generation of new electric technologies does not mean the decarbonization has gone through the entire value chain.

Dr. Subodh Das suggested considering changing the name of the Subcommittee as it currently implies creating barriers rather than identifying and overcoming barriers.

- **Dr. Choi** replied that she will discuss this point with the Subcommittee and consider alternative names, e.g., "Mitigating Barriers" or something similar.

Report Out: ITIAC Subcommittee on Industrial Sectors

Subcommittee lead Dr. Das presented an overview of the most recent ITIAC Subcommittee on Industrial Sectors meeting, focusing on the group's discussion of which industries to address and prioritizing the industries by their impacts on the overall carbon footprint. He stated that the members discussed prioritizing industries that have the greatest impact on managing GHGs and on emerging fields of industry, rather than prioritizing solely on GHG (greenhouse gas) emissions.

Dr. Das asked the ITIAC for some additional input to help determine criteria for identifying sectors of industry to be addressed and assigning priorities to the sectors.

Discussion Highlights

DFO Dr. Pritchard offered to help with compiling reports and funding figures from DOE for review by the Subcommittee. He also stated he can provide funding figures from DOE.

Chairperson Nolen stated she plans to join subcommittee meetings to keep abreast of activities and support them where needed. Subcommittees may be broken into further divisions for tasking and if others want to contribute. Experts from outside ITIAC may also be brought into specific tasks if needed. Subcommittees should check with Dr. Pritchard to make those special assignments.

Dr. Powell commented that the United States could lead the world in dissemination of decarbonization information, particularly in refining innovation, iron and steel industry global supply chain and utilization of CO₂ and renewable energy in cement. The Subcommittee needs to think globally in terms of the technology impact of these decarbonization opportunities.

Mr. Rissman encouraged the subcommittees to share documents and collaborate to prevent work duplication. He shared a document in which the DOE Current Work and Gaps Assessment Subcommittee is compiling funding by sector.

Dr. Elliott noted the importance of considering data centers in the greater discussion of decarbonization, but that it may not be an appropriate topic for ITIAC to cover as it is fundamentally different from manufacturing. He recommended that decarbonization of data centers be addressed separately by DOE leadership. He further suggested that for ITIAC's purposes, access to data centers and AI may represent a barrier to decarbonization. He also commented the steel industry uses both primary and secondary materials and as the industry is segmented by direct reduction and electric arc furnace use, it will need different approaches to decarbonize.

Dr. Das noted that the United States leads the world in manufacturing using recycled materials and there is a need to rethink or reestablish specifications for reusing materials.

- **Dr. Elliott** noted that one challenge in the steel industry is that there is not enough scrap to meet global market needs as they expand, which is different than some other industrial sectors.
- **Dr. Abraham** commented that as the steel industry moves to convert plants to electric arc, the quality and availability of scrap will diminish. Some scrap contains contaminants that can reduce quality for certain industries, i.e., automotive. The industry is exploring whether significant amount of iron units can be melted in an electric arc furnace without affecting the key melting parameters of the material to remain economically sound.
- **Dr. Eric Masanet** noted that in the other manufacturing sectors, approximately one third of current energy use, and sectors such as semiconductor or battery manufacturing have important implications for decarbonization. Recycling issues such as reclamation of critical materials, battery recycling, solar photovoltaic recycling reclamation, will grow with the direction of future manufacturing and clean energy use.

Dr. Abigail Regitsky recommended that the members should think more globally on the criteria and GHG because U.S. activity impacts and influences other countries. Cement imports are important, but cement and clinker are manufactured in the United States and should not be dismissed. To identify the industries for decarbonization, the Subcommittee needs to determine what criteria make sectors important to address and how that criteria meets the Committee's goals to focus on as gaps in other analyses. She also asked if there are specific sectors identified by DOE for the Committee to address.

Ms. Anna Fendley stated she was glad to see where funding has been going for decarbonization efforts and agreed that the subcommittees should work together to minimize overlap and address gaps.

Dr. Das expressed appreciation for the comments from members, which give more direction to the Subcommittee. He plans to formulate some next steps from the discussion.

Report Out: ITIAC Subcommittee on Cross-Cutting Technologies and Opportunities

Subcommittee lead Dr. Masanet presented slides containing an overview of the ITIAC Subcommittee on Cross-Cutting Technologies and Opportunities success goals, opportunities identified, and next steps toward the ITIAC report. He shared the Subcommittee's definition of cross-cutting opportunities as technologies or practices that cut across most or all industrial subsectors. He noted that the Subcommittee had identified several cross-cutting opportunities, but the list was not prioritized.

Discussion Highlights

Dr. Abraham asked for clarification on the Subcommittee's definitions of machine learning and artificial intelligence (AI).

- **Dr. Masanet** stated that the list uses terms that resonate with different stakeholders; machine learning uses AI, but in a more traditional sense, machine learning is training models using datasets for specific function, i.e., material discovery, energy optimization.

Dr. Powell noted that hydrogen seemed to be missing from the list of opportunities, and it is often cited with electrification and biofuels as vectors for decarbonization. Hydrogen can be applicable in other ways than just supply/generation.

- **Dr. Masanet** stated that the Subcommittee would consider elevating it as a cross-cutting technology beyond the need infrastructure.
- **Dr. Elliott** noted that one issue starting to emerge is a competition for energy resources between data centers and industrial electrification applications in places like Arizona, Georgia, and North Carolina. He stressed that hydrogen is a finite resource, and its use for clean energy generation will likely require public policy to govern and prioritize its application within the economy.
- **Mr. Rissman** recommended that very clear prioritization of technologies can be useful to industry. He agreed that hydrogen can be feedstock for electrification, but combustion has significant energy losses and hydrogen use should be prioritized for most efficient application.
- **Dr. Masanet** stated the Subcommittee will coordinate very closely with the Industrial Sector Subcommittee on applications of hydrogen.
- **Dr. Powell** agreed that hydrogen paired with carbon capture and storage is one of the best solutions for sectors that cannot decarbonize with electrification.

Report Out: ITIAC Subcommittee on Workforce and Social Considerations

Subcommittee lead Ms. Fendley introduced her fellow ITIAC Subcommittee on Workforce and Social Considerations members, Dr. Sue Clark, Dr. Regitsky, and Dr. Sridhar Seetharaman, and presented the milestones and scope. She noted that the work of this Subcommittee will be applicable to all the other subcommittees' considerations as well. Their focus will include all aspects of workforce impacts from decarbonization, including training by colleges and other certification organizations and development of community benefits plans (CBPs).

Discussion Highlights

Ms. Fendley asked the members to consider whether the Workforce and Social Considerations work should remain a separate chapter in the ITIAC report or be distributed throughout the other chapters.

- **Chairperson Nolen** responded that the treatment of the workforce information was a good topic for discussion in the Report Outline Subcommittee.
- **Dr. Elliott** stated that the other subcommittees are also considering the workforce issue. He considered it to be one of the higher priority activities of ITIAC and recommended keeping workforce in a separate section as well as including in each of the other sections. CBPs are a big issue in DOE and should be included in the scope of the ITIAC.
- **DFO Dr. Pritchard** noted that his initial feeling is that CBPs could be a part of ITIAC's scope and are certainly part of the workforce development activities. He stated CBPs are tools for understanding the broader impacts of industry and decarbonization on communities.
- **Dr. Elliott** proposed that CBPs should be addressed as a specific topic in the report.
- **Dr. Comas Haynes** commented that CBPs will be critical for certain communities that host manufacturing sites and may be cautious or concerned about new or different technologies building out in their areas (e.g., extensive use of hydrogen as a decarbonized fuel alternative). Community engagement and ultimately buy-in is pivotal.
- **Ms. Fendley** stated that the Subcommittee did raise CBP as a specific topic under their scope that should be addressed as a workforce and social considerations tool in the report.

Mr. Rissman suggested the topic of the workforce transition to clean energy and the continued competitiveness of products is in the scope of this Subcommittee to discuss, including ideas such as a carbon border or other similar economic tools to prevent undercutting domestic clean manufactured products.

- **Chairperson Nolen** responded that the ITIAC Subcommittee on Economic Competitiveness is probably better suited for that discussion.

Report Out: ITIAC Subcommittee on DOE Current Work and Gaps Assessment

Subcommittee co-lead Mr. Rissman presented an overview of the ITIAC Subcommittee on DOE Current Work and Gaps Assessments organization of its section of the ITIAC report, breaking it into two parts: a factual overview of current DOE activities and partnerships and actionable recommendations. He noted that the content of the second section will rely on input from the other subcommittees to coordinate messages and recommendations that are directly applicable to the findings.

Discussion Highlights

Chairperson Nolen asked if there is overlap within DOE on activities and if that includes national labs. She asked if national labs' projects overlap with each other.

- **Mr. Rissman** responded that national labs are being considered as part of the DOE network, but details have not been fleshed out yet. He stated they may find overlaps.
- **Dr. Clark** commented that the national labs have synergies in projects rather than overlaps.

Report Out: ITIAC Subcommittee on Economic Competitiveness

The ITIAC Subcommittee on Economic Competitiveness presentation was postponed due to the Subcommittee lead's absence from the meeting.

Discussion

Gaps

Chairperson Nolen opened the floor for discussion of gaps in anything that was discussed by the subcommittees or overall.

Ms. Betsy Dutrow raised the issue of indoor crop production that is emerging in a grey area between the food and beverage industry and the agriculture industry. Currently this crop production is not considered industrial or manufacturing but is becoming an issue as indoor crops draw a lot of electricity.

- **Dr. Elliott** concurred that controlled environment agriculture (CEA), which now includes vertical agriculture, urban agriculture, other forms of growing is becoming more prominent in the industry.
- **Ms. Dutrow** expressed concern that as food supplies continue to be disrupted in traditional outdoor growing due to drought, extreme heat, and other factors, agriculture may see greater expansion of CEA as an industry. She noted that greenhouse facilities can rival steel plants in energy use. Some sort of anticipatory research into this developing sector would be timely.
- **Dr. Elliott** noted that IEDO has begun preliminary tracking of this issue, and the U.S. Department of Agriculture is doing quite a bit of work with regard to the changing industry, finding that the delineation between agriculture and food and beverage is unclear. The economic census does not cover agriculture because it is under the Census of Agriculture, which includes energy usage analysis, but does not include manufacturing. As a result, facilities that overlap between sectors and are not clearly tracked.
- **Chairperson Nolen** suggested that the Industrial Sectors Subcommittee discuss CEA. Dr. Das stated he will address CEA with the Industrial Sectors Subcommittee.
- **Mr. Cresko** shared the Quadrennial Technology Review 2015, Chapter 6 regarding some of the issues/opportunities at the intersection of "traditional" industry, manufacturing/advanced manufacturing, and clean energy technologies, <https://www.energy.gov/quadrennial-technology-review-2015>.

DFO Dr. Pritchard reminded the Committee of focus areas described in section 454(c) of the Energy Independence and Security Act that were part of the following establishing language but had not yet been covered by the subcommittees. He shared the following excerpt from the focus areas list:

2. Alternative materials that produce fewer emissions during production and result in fewer emissions during use, including--
 - a. Innovative building materials;
 - b. High-performance lightweight materials; and
 - c. Substitutions for critical materials and minerals;
3. Development of net-zero emissions liquid and gaseous fuels;
4. Emissions reduction in shipping, aviation, and long distance transportation;

DFO Dr. Pritchard stated that topics can be removed from the list if the members feel they are not applicable or can be considered for integration into the current subcommittees' scopes.

- **Dr. Elliott** stated he felt Items 2 and 3 were covered under the industry sectors: Item 3 in chemicals, Item 2a in cement, and Item 2b in automotive. He noted Item 4 is a supply chain issue

that has not yet been covered by the subcommittees. Manufacturing drives the freight and supply chain activity.

- **Dr. Powell** stated that shipping and aviation are included in all other industries. He further noted that transportation sectors may be covered by other committees, not ITIAC. Much of the decarbonization will be in fuels and efficiency of vehicles though lightweight materials, etc.
- **Chairperson Nolen** reminded members that they already have a huge task with industry and need to set boundaries to limit responsibilities. She suggested ITIAC not include the transportation sector in its activity but agreed that industry will address some of these issues through production of materials.
- **DFO Dr. Pritchard** will check if there are other Federal Advisory Committees addressing any of the transportation items before ITIAC considers taking it on.

Overlaps

Ms. Sasha Stashwick asked if the Committee could determine a process that helps subcommittees coordinate on areas they have in common. The work of some subcommittees depends on the findings of other subcommittees.

- **Chairperson Nolen** stated that the Report Outline Subcommittee opted to meet after the other subcommittees prepared their scopes. She recommended that the subcommittee leads meet to work out details or possibly assign a pair of members to monitor overlaps.
- **Dr. Choi** stated that most subcommittees have members who are on other subcommittees who also could monitor overlaps and serve on the Report Outline Subcommittee.
- **Chairperson Nolen** agreed that was a good idea and confirmed that all subcommittees are represented on the Report Outline Subcommittee.
- **Dr. Pritchard** reminded members that if more than half the ITIAC members meet, then it constitutes a quorum and will be required to be open to the public. Public meetings require advanced planning for public notification and participation. Joint meetings among subcommittees would typically constitute a quorum.
- **Chairperson Nolen** asked members to review the Report Outline Subcommittee member list and decide if any changes are needed. She also reiterated the plan for the subcommittees to utilize members on multiple committees to track overlaps in research and work together to resolve those among the subcommittees. No objections were recorded.

Ms. Dutrow suggested that the membership consider whether another Subcommittee to review data sources on the industry sector, i.e., Energy Information Administration (EIA) census, should be formed.

- **DFO Dr. Pritchard** stated there is no limit on the number of subcommittees.
- **Ms. Dutrow** noted that industry data is not reliable or complete.
- **Dr. Elliott** noted that reporting and data collection challenges are exacerbated by the emergence of new industries. The Census Bureau manages the North American Industry Classification System (NAICS) codes, which categorize industry, and industries are changing but the codes are not. As a result, EIA data is not well segmented, economic models do not work because industry does not look like it did when the model was built, and industry can face problems with strategic business planning. EIA is currently trying to restructure the model for the Annual Energy Outlook.

- **Ms. Dutrow** noted that the impact of the disconnect and needed changes to NAICS and its categorizations needs to be conveyed to DOE administration.
- **Chairperson Nolen** said that statement sounds like a barrier rather than a separate Subcommittee.
- **Mr. Rissman** noted that providing better access to data is on the DOE Current Work and Gaps Assessment Subcommittee's outline and they will work on it with the Barriers Subcommittee.
- **Ms. Dutrow** suggested the DOE Current Work and Gaps Assessment Subcommittee might benefit from inviting experts to present to them.
- **Mr. Rissman** stated the DOE Current Work and Gaps Assessment Subcommittee will incorporate the information into its chapter.
- **Dr. Elliott** requested that Chairperson Nolen reach out to EIA to present on industrial data and modeling at the fall meeting rather than just to a subcommittee as it could become an important recommendation to the Secretary.
- **Ms. Dutrow** suggested EIA could share its list of improvements to be implemented.
- **Dr. Pritchard** agreed that a presentation from EIA could be requested for the ITIAC meeting in October.

Chairperson Nolen stated the Report Outline Subcommittee will meet soon after this meeting.

Report Timeline

Chairperson Nolen stated the current schedule is to send the report to the Secretary at end of September 2025 and asked for any concerns from the subcommittees. She stated she would check in with each of the subcommittees' meetings to make sure preparation stays on track.

General Questions and Comments

Chairperson Nolen opened the floor for members to discuss the comments entered in the Mural board or to bring up any additional comments or ideas.

Alternate Designated Federal Officer (ADFO) Dr. Celina Harris read a comment in the barriers section regarding a concern that national prioritization of industrial decarbonization could change.

- **Chairperson Nolen** stated the intent of ITIAC charter was to provide continuity across administrations to continue to address the issues.
- **DFO Dr. Pritchard** stated that ITIAC activity is set by statutory language and that the Committee was formed to give actionable recommendations to DOE.

ADFO Dr. Harris read the Mural comment: The DOE Current Work and Gaps Assessment Subcommittee relies in part on the other subcommittees and its material may cross multiple sections of the report.

- **Ms. Fendley** noted she will reach out to the other subcommittees for feedback.
- **Dr. Regitsky** stated the DOE Current Work and Gaps Assessment Subcommittee work will be based on other subcommittees' activities. Gaps will be included as its own chapter with more general analysis but will be linked to other chapters for specific applications.

ADFO Dr. Harris reported that all other comments on the Mural board had already been discussed.

Dr. Elliott suggested it is important to capture emerging issues, such as battery manufacturing and other industries, that are fundamentally different from industries that were considered in their sectors in the past, i.e., CEAs, gigawatt load manufacturing.

- **Chairperson Nolen** concurred that emerging industry should at least be included as an item that needs to be monitored for the future.

Dr. Elliot reiterated that EIA is struggling with categorization in demand modeling.

DFO Dr. Pritchard asked that the Report Outline Subcommittee include the legislative direction for the Committee and map the directives through the individual subcommittees to make sure all the focus areas are covered. He stated the staff can help identify items to be discussed at the next full committee meeting that could be changed from what was originally laid out in the legislation.

- **Ms. Fendley** asked for a general timeline that the Report Outline subcommittee will respond to the other subcommittees.
- **Chairperson Nolen** stated details will be sent out to the subcommittees in the next 4–6 weeks.

Public Comments

No public comments were submitted prior to the meeting. Dr. Pritchard noted that members of the public may send written comments to ITIAC@ee.doe.gov.

Closing Remarks

Chairperson Nolen thanked the Committee members for their work and input in the process so far. She reminded everyone that the next full ITIAC meeting will be October 29–30, 2024, in person in Washington D.C.

Chairperson Nolen recapped ideas for the October 2024 meeting.

- Presentation on the takeaways from the *Transforming Industry* workshop held in May 2024 and RFI which closed June 2024.
- EIA presentation on upcoming changes to NAICS and other classifications for industry.
- Members may send other ideas to ITIAC@ee.doe.gov.

DFO Dr. Pritchard also raised two other potential ideas for the October meeting that had been requested as presentations to specific subcommittees.

- Briefing by the DOE Office of Energy Justice and Equity to the Workforce and Social Considerations Subcommittee.
- Presentations on DOE standards-setting authorities to the DOE Current Work and Gaps Assessment Subcommittee.

Chairperson Nolen asked Ms. Dollinger to send a poll to the members to ask if the additional items should be part of the October meeting or be limited to presentations to the specific subcommittees.

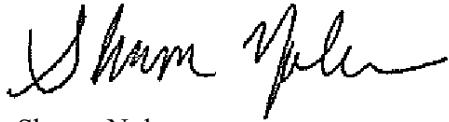
Adjournment

The second ITIAC meeting was adjourned at 3:48 p.m. EDT.

Respectfully submitted:

Zachary Pritchard
Designated Federal Officer

I hereby certify that these meeting minutes of the July 17, 2024, ITIAC meeting are true and correct to the best of my knowledge.

A handwritten signature in black ink, appearing to read "Sharon Nolen", written in a cursive style.

Sharon Nolen
Chairperson, Industrial Technology Innovation Advisory Committee